U. S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
ASSISTANT SECRETARY FOR HOUSING-FEDERAL HOUSING COMMISSIONER

TO: DIRECTORS, HOUSING DEVELOPMENT DIVISION

Series and Series Number: (Supersedes issue dated February 25, 1992)
MATERIALS RELEASE
NO. 1090d

ISSUE DATE August 16, 1995

REVIEW DATE August 16, 1998

SUBJECT: 1. Product — YTONG Precast Autoclaved Lightweight Concrete (ALC) Floor, Roof and Wall Panels

2. Name and Address of Manufacturer — YTONG AG
Hornstrasse 3
80797 Munchen
Germany

Data on the nonstandard product described herein have been reviewed by the Department of Housing and Urban Development and determination has been made that it is considered suitable from a technical standpoint for the use indicated herein. This Release does not purport to establish a comparative quality or value rating for this product as compared to standard products normally used in the same manner.

This Materials Release cannot be used as an indication of endorsement, approval or acceptance by HUD of the described product, and any statement or representation, however made, indicating such approval, endorsement or acceptance by HUD is unauthorized. See Code 18, U.S.C. 709.

Any reproduction of this Release must be in its entirety.

USE: Structural Floors and roofs, curtain walls and partitions

DESCRIPTION:

YTONG ALC is noncombustible siliceous material manufactured from a mixture of sand, quicklime and portland cement. The mixture is aerated with aluminum powder or some other chemical substance and cured in a high-pressure autoclave. The product has a dry density of 31.2 pcf (500 kg/m^3), average thermal conductivity 0.881 Btu in/hr./sq. ft./°F (0.127 W/mK) and an ultimate compressive strength of 435 psi (3.0 MPa). YTONG ALC panels can be sawed, bored, nailed or chased. Precast panels are intended for use as structural roof and floor units, nonbearing curtain walls, and partitions. Units are reinforced with smooth cold drawn steel bars conforming to ASTM A82. Transverse bars are welded to the longitudial reinforcement for proper placement to provide anchorage. Reinforing steel is protected with an anti-corrosion treatment of .02 in. minimum thickness and covered with a minimum 1/2 in. autoclaved concrete. The average moisture content at delivery is about 30 percent by weight. This moisture dissipates gradually to an equilibrium condition of 4-6 percent by weight. All metal connectors, fasteners and accessories used with the product shall be aluminum or galvanized steel. The galvanized coating shall comply with ASTM A153-82.

ANALYSIS AND DESIGN:

All structures shall be analyzed and designed by a licensed professional engineer. The design of all precast units shall be in accordance with standard structural engineering design procedure set forth in Appendix B - of the American Concrete Institute (ACI) "Building Code Requirements for Reinforced Concrete" (ACI 318-89) except as otherwise indicated in this Materials Release (MR).

Design Data:

Flexure, extreme fiber stress in compression, F_c	185 psi	(1.28 MPa)
Shear stress with no web reinforcement, V_c	11 psi	(0.076 MPa)
Bearing stress, F_b	140 psi	(0.965 MPa)
Modulus of Elasticity of concrete, E_c	250 ksi	(1,720 MPa)
Reinforcing steel, F_s	26 ksi	(180.0 MPa)

MANUFACTURING AND INSTALLATION:

Installation shall be in accordance with the Euro-International Committee for Concrete (CEB) Manual of Design and Technology, Autoclaved Aerated Concrete and the following provisions:

a. Roof and floor units

Roof and floor units are manufactured with tongue-and-groove joints. The long sides have their bottom edges chamfered. See Figure No. 1 for details. Tables No. I and II are available pre-engineered floor and roof units indicating the design superimposed loads, thicknesses and nominal lengths. The manufactured length is 3/4 in. shorter than the nominal length. Units of special dimensions may be supplied on order. Panels up to 14 ft. long shall have a minimum 2 in. bearing and panels up to 20 ft. long shall have a minimum 2 1/2 in. bearing. Anchorage shall be in accordance with the manufacturer's recommendations. Typical anchorage details to structural steel framework are shown in Figure No. 2. Anchorage stirrups are provided at every second joint. Steel reinforcement within the top groove has a length equal to one third the span. The grooves are filled with Type M mortar. Maximum cantilever of a unit shall be limited to two time its thickness, unless special calculations are provided to justify greater overhangs.

Built-up roof as permitted by the HUD Minimum Property Standards, may be used with a slope of 2 1/2 on 12 or less. In the case of pitched roofs with a slope in excess of 2 1/2 on 12, shingles may be used and they shall be attached with galvanized roofing nails. Interior finish of ceiling shall consist of a paint having relatively high permeability and YTONG shall maintain a list of the acceptable paints. Surface of floor panels shall be protected from wetting and abrasion by the application of a topping recommended by the manufacturer to provide a wearing surface or base for floor finish.

b. Curtain Walls

Wall units are designed to resist the lateral loads, shown in Table No. III, and can be erected with the long dimension either vertical or horizontal. All wall units have two layers of equal reinforcement. Vertical units have semicircular grooves on their sides and chamfered exterior edges (Figure No. 3). Horizontal units have tongue-and-groove joints, similar to the roof and floor panels and chamfered longitudinal edges. Table No. III indicates the available range of thicknesses and nominal lengths of wall units.

Typical connections to structural steel framework are shown in Figures No. 4, 5, and 6. Vertical wall units have reinforcing rods inserted into the grooves between units at each end for a distance of at least one-third the panel length. These grooves are then filled with Type M mortar. A steel plate held by the reinforcement is welded to the structural steel as shown. Horizontal units are held by bolted hooks welded to the structural steel with a minimum edge distance of 3 in. A typical connection for seismic areas is shown in Figure No. 6.

The external surface of the wall shall be protected from the weather and finished with treatments as recommended by the manufacturer. The joints are pointed before surface treatment and after which an elastic sealing compound is applied to expansion joints. Interior surfaces can be painted or finished with other acceptable interior wall finish, after an initial sand spackle coating.

c. Partition Panels

Partition panels are designed to resist a lateral load of 10 psf. They are 24 in. wide, 3 or 4 in. thick, and are available in lengths between 7 ft. to 8 ft. 6 in. in 2 in. increments. They have a rectangular cross section with reinforcement placed at mid-depth. Partition panels are joined with a cement base glue, which is provided by YTONG AG, and are installed in accordance with the details provided by the manufacturer.

d. Miscellaneous

Precast units must be at least 12 in. above finish grade unless they are protected from moisture absorption from the ground by application of the dampproofing recommended by the manufacturer. Grooves for electrical wiring and holes for junction boxes may be made on site in partition panels or curtain walls only when approved by the engineer. Openings in roof and floor units which are field cut shall be designed by the engineer.

TABLE NO. 1 - ROOF UNITS (Width 24 in.) [1] [2]

ALLOWABLE SUPERIMPOSED LOAD (psf)	THICKNESS (inches)	NOMINAL LENGTH (Feet)						
		8	10	12	14	16	18	20
22.5	4	x	x					
	6	x	x	x	x	x	x	
	8	x	x	x	x	x	x	x
	10	x	x	x	x	x	x	x
32.8	4	x	x					
	6	x	x	x	x	x		
	8	x	x	x	x	x	x	x
	10	x	x	x	x	x	x	x
43.0	4	x	x					
	6	x	x	x	x	x		
	8	x	x	x	x	x	x	x
	10	x	x	x	x	x	x	x
63.5	6	x	x	x	x			
	8	x	x	x	x	x	x	
	10	x	x	x	x	x	x	x

[1] All roof units designed for deflection of less than 1/360 span due to live loads and less than 1/240 span due to live load and dead load.

[2] Tolerances: Length: ± 1/4 inch
Width: ±1/16 inch
Thickness: ±1/16 inch

TABLE NO. II - FLOOR UNITS (Width 24 in.)[1] [2]

ALLOWABLE SUPERIMPOSED LOAD (psf)	THICKNESS (inches)	NOMINAL LENGTH (FEET)						
		8	10	12	14	16	18	20
48.0	6	x	x	x				
	8	x	x	x	x	x		
	10	x	x	x	x	x	x	x
83.5	6	x	x	x				
	8	x	x	x	x	x		
	10	x	x	x	x	x	x	

[1]All floor units are designed for deflection of less than 1/360 span due to live loads and less than 1/240 span due to live load and dead load.

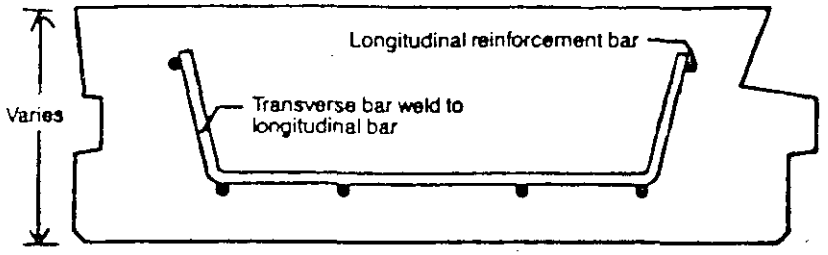
[2]Tolerances: Length: ± 1/4 inch
Width: ±1/16 inch
Thickness: ±1/16 inch

TABLE NO. III - CURTAIN WALL UNITS (Width 24 in.) [1] [2]

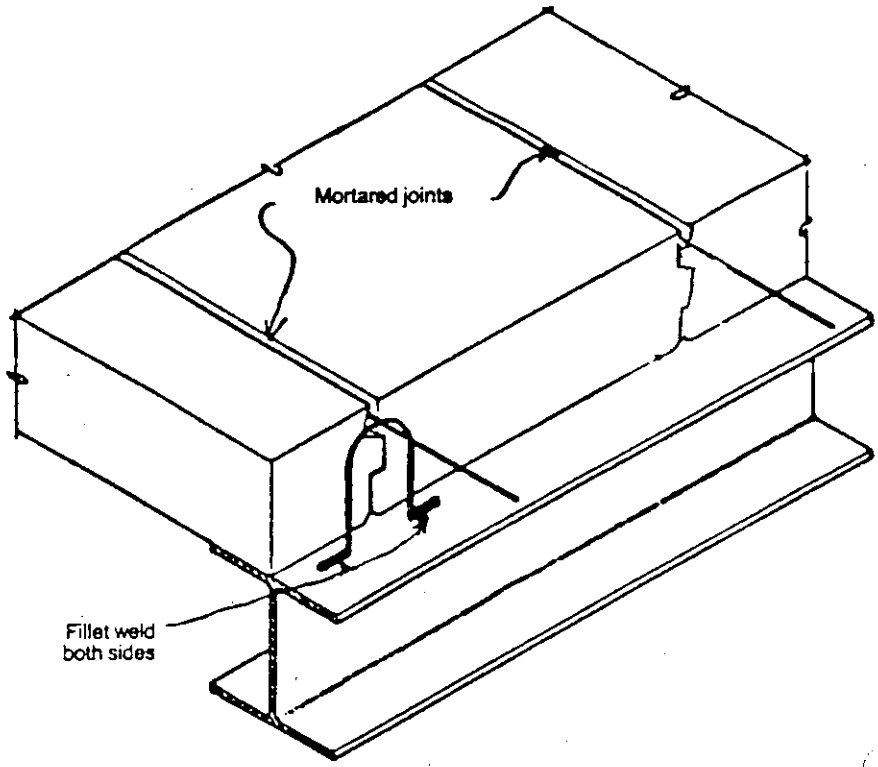
ALLOWABLE SUPERIMPOSED LOAD (psf)	THICKNESS (inches)	NOMINAL LENGTH (FEET)			
		10	14	18	20
30.8	6	x	x	x	x
	8	x	x	x	x
	10	x	x	x	x

[1]All floor units are designed for deflection of less than 1/360 span due to live loads and less than 1/240 span due to live load and dead load.

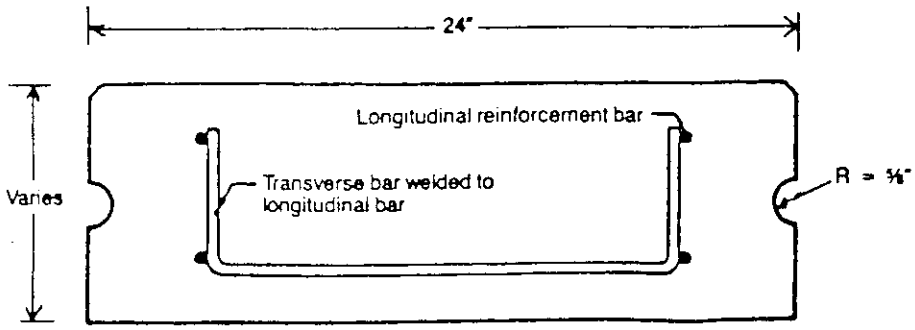
[2]Tolerances: Length: ± 1/4 inch
Width: ±1/16 inch
Thickness: ±1/16 inch



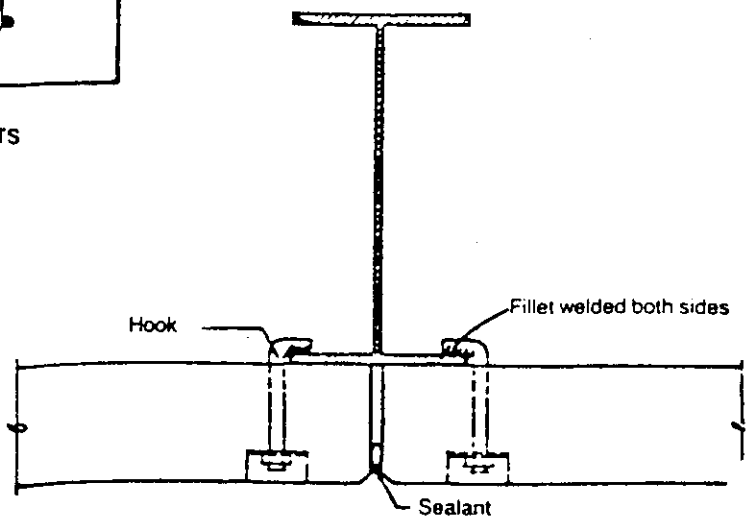
CROSS SECTION OF TYPICAL ROOF AND FLOOR UNITS
FIGURE NO. 1



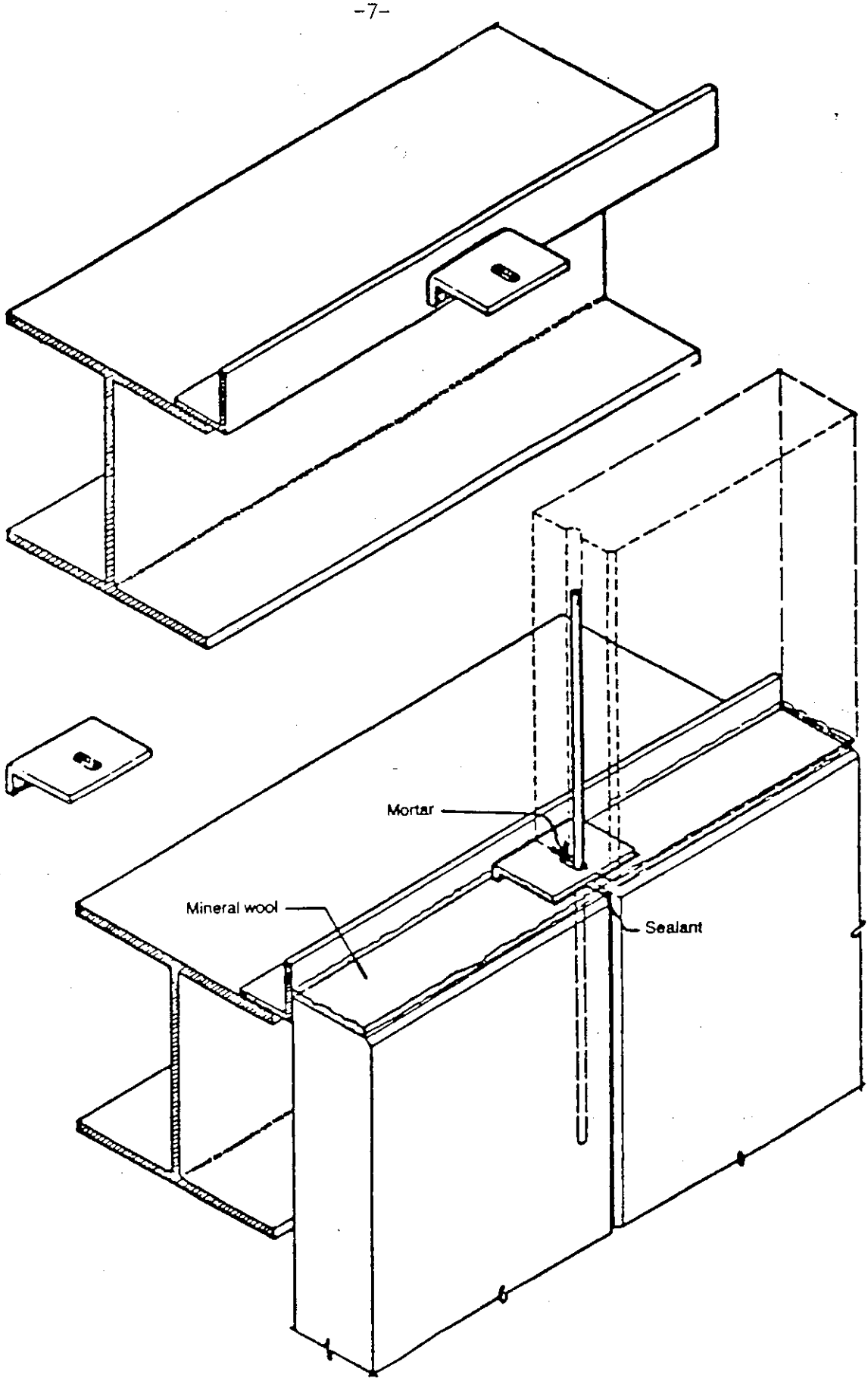
TYPICAL ANCHORAGE OF ROOF AND FLOOR UNITS TO STRUCTURAL STEEL FRAME
FIGURE NO. 2



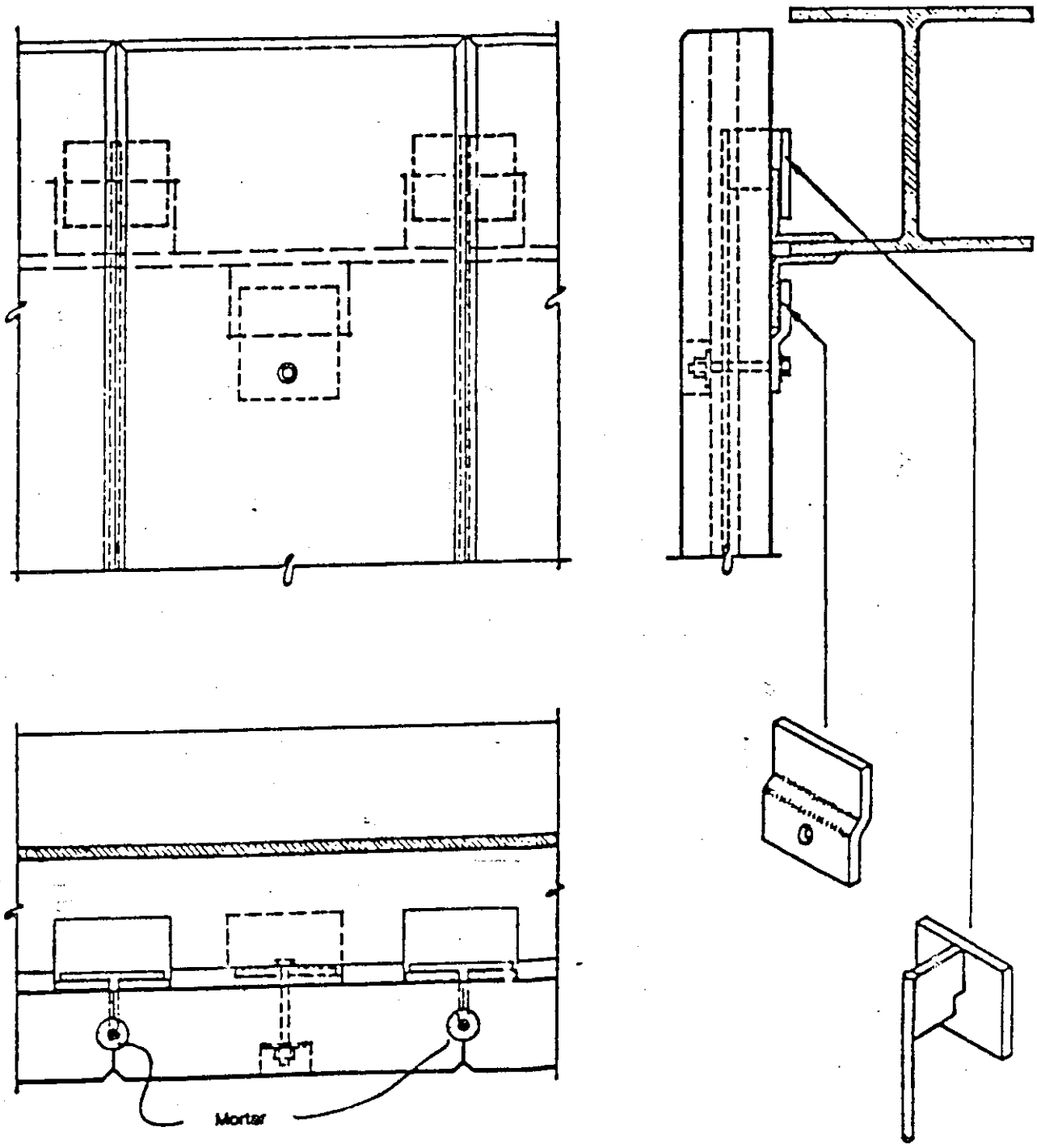
CROSS SECTION OF TYPICAL VERTICAL WALL UNITS
FIGURE NO. 3



TYPICAL CONNECTION OF HORIZONTAL WALL UNITS
TO STRUCTURAL STEEL FRAME (PLAN)
FIGURE NO. 4



TYPICAL CONNECTION OF VERTICAL WALL UNITS TO STRUCTURAL STEEL FRAME
FIGURE NO. 5



TYPICAL CONNECTION OF VERTICAL WALL UNITS TO STRUCTURAL STEEL FRAME
FIGURE NO. 8

IDENTIFICATION AND LABELING:

YTONG AG shall certify that YTONG precast ALC panels conform to the requirements of this MR. The Official Building Materials Testing Institute of the Technical University in Braunschweig shall validate the manufacturer's certification that YTONG precast ALC panels meet the requirements of this MR. Validation records shall be made available for examination by HUD when requested.

Each panel certified as conforming to this MR shall bear the label of the manufacturer, allowable load, maximum span and HUD MR No. 1090d.

INSPECTION:

HUD Field Office personnel will make site inspections to ensure compliance with the special structural system covered by this MR. A copy of the field inspection report and supplementary information shall be sent to HUD Headquarters when there is evidence of noncompliance with any portion of this MR or if the system does not appear to give satisfactory performance.

CERTIFICATION AND WARRANTY:

Precast ALC panels covered by this MR shall be erected by a company ("Contractor") whose personnel have been trained by YTONG AG, or by a duly authorized licensee of YTONG AG which has manufactured the products covered by this MR ("Licensee"). YTONG or the Licensee shall furnish the Contractor with a certificate which states that the Contractor is qualified to perform the work. Erection of precast ALC panels shall be in accordance with the CEB Manual of Design and Technology, Autoclaved Aerated Concrete, and this Materials Release, and shall be the responsibility of the contractor.

For a period of four (4) years from the date of initial occupancy, the manufacturer shall warrant the owner that the panels covered by this MR shall be free of defects which materially affect the structural integrity or the weather resistance of the constructed property.

The liability of the manufacturer under this warranty shall be limited to replacement of defective materials and the cost of installation; or at the option of the manufacturer, payment in lieu thereof. The manufacturer shall not be liable for damage resulting from fire or natural catastrophes such as floods, tornados or the failure of the soil to support the foundation. This warranty shall be in lieu of all other warranties, expressed or implied. The manufacturer shall not be liable for incidental or consequential damages such as lost rents or profits.

The manufacturer's warranty does not relieve the builder, in any way, of the responsibility under the terms of the Builder's Warranty required by the National Housing Act, or under any provisions applicable to any other housing program. A copy of the warranty shall be furnished by the builder to the owner upon completion of the property.

MANUFACTURER'S RESPONSIBILITIES:

Issuance of this Materials Release (MR) commits the manufacturer to fulfill, as a minimum, the following:

1. Produce, label and certify the material, product or system in strict accordance with the terms of this MR.

2. Provide necessary corrective action in a timely manner for all cases of justified complaint, poor performance or failure reported by HUD.

3. When requested, provide the Office of Manufactured Housing and Regulatory Functions, Manufactured Housing and Construction Standards Division, HUD Headquarters, with a representative list of properties in which the material, product or system has been used, including complete addresses or descriptions of locations and dates of installation.

4. Inform HUD in advance of changes in production facilities, methods, design of the product, company name, ownership or mailing address.

EVALUATION:

This MR shall be valid for a period of three years from the date of initial issuance or most recent renewal or revision, whichever is later. The holder of this MR shall apply for a renewal or revision 90 days prior to the Review Date printed on this MR. Submittals for renewal or revision shall be sent to HUD Headquarters. Appropriate User Fees shall be sent to:

U. S. Department of Housing and Urban Development
Technical Suitability of Products Fees
P. O. Box 954199
St. Louis, MO 63195-4199

The holder of this MR may apply for revision at any time prior to the Review Date. The revision may be in the form of a supplement to the MR.

If the Department determines that a proposed renewal or supplement constitutes a revision, the appropriate User Fee for a revision will need to be submitted in accordance with Code of Federal Regulations 24 CFR 200.934, "User Fee System for the Technical Suitability of Products Program," and current User Fee Schedule.

CANCELLATION:

Failure to apply for a renewal or revision shall constitute a basis for cancellation of this MR. HUD will notify the manufacturer that the MR may be canceled when:

1. conditions under which the document was issued have changed so as to affect production of, or to compromise the integrity of the accepted material, product, or system,

2. the manufacturer has changed its organizational form without notifying HUD, or

3. the manufacturer has not complied with responsibilities it assumed as a condition of HUD's acceptance.

However, before cancellation, HUD will give the manufacturer a written notice of the specific reasons for cancellation, and the opportunity to present views on why the MR should not be canceled. No refund of fees will be made on a cancelled document.

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This Materials Release is issued solely for the captioned firm, and is not transferable to any person or successor entity.
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